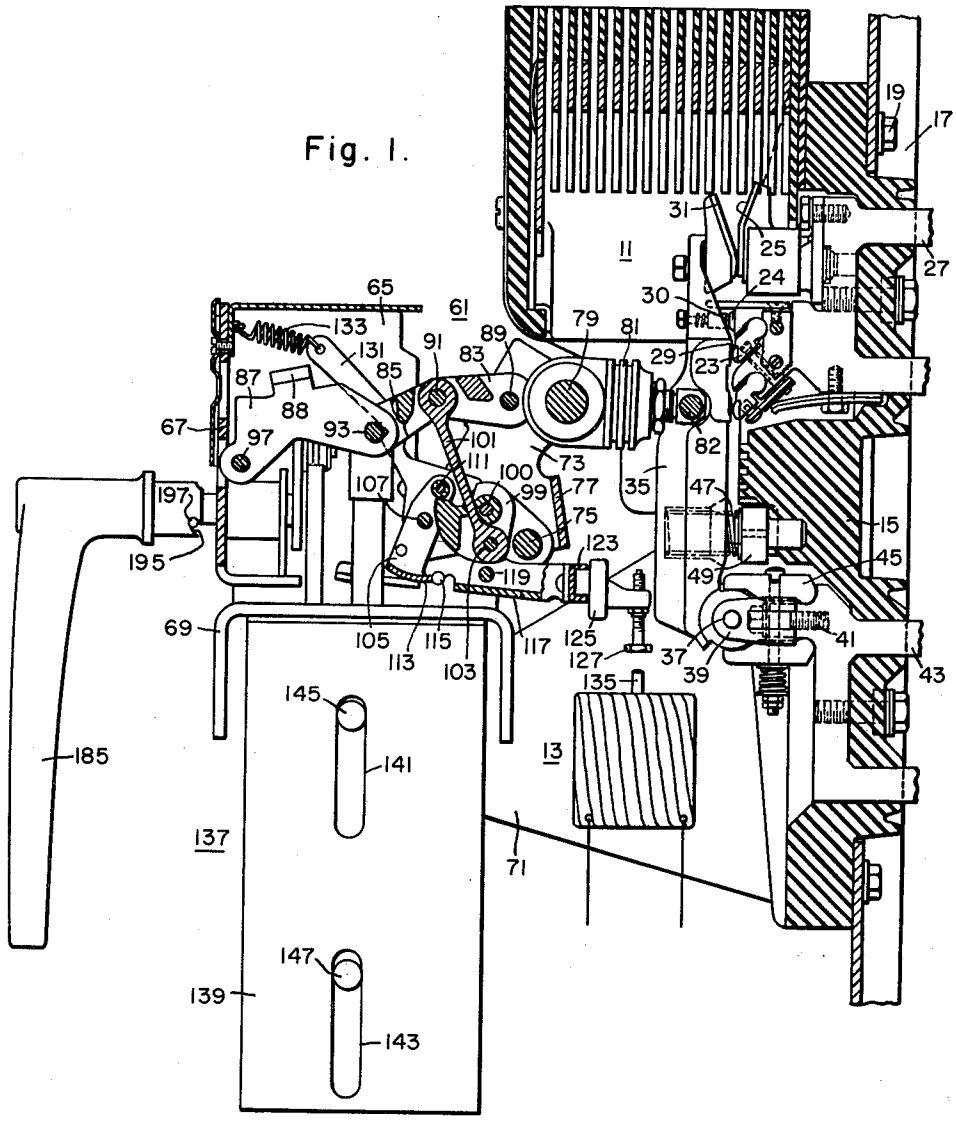
July 17, 1962 G. D. GAMEL ET AL 3,045,083

SPRING CLOSING MECHANISM FOR CIRCUIT BREAKERS

Filed June 25, 1959 5 Sheets-Sheet 1

Fig. 1.



WITNESSES

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BY

ATTORNEY

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SPRING CLOSING MECHANISM FOR CIRCUIT BREAKERS

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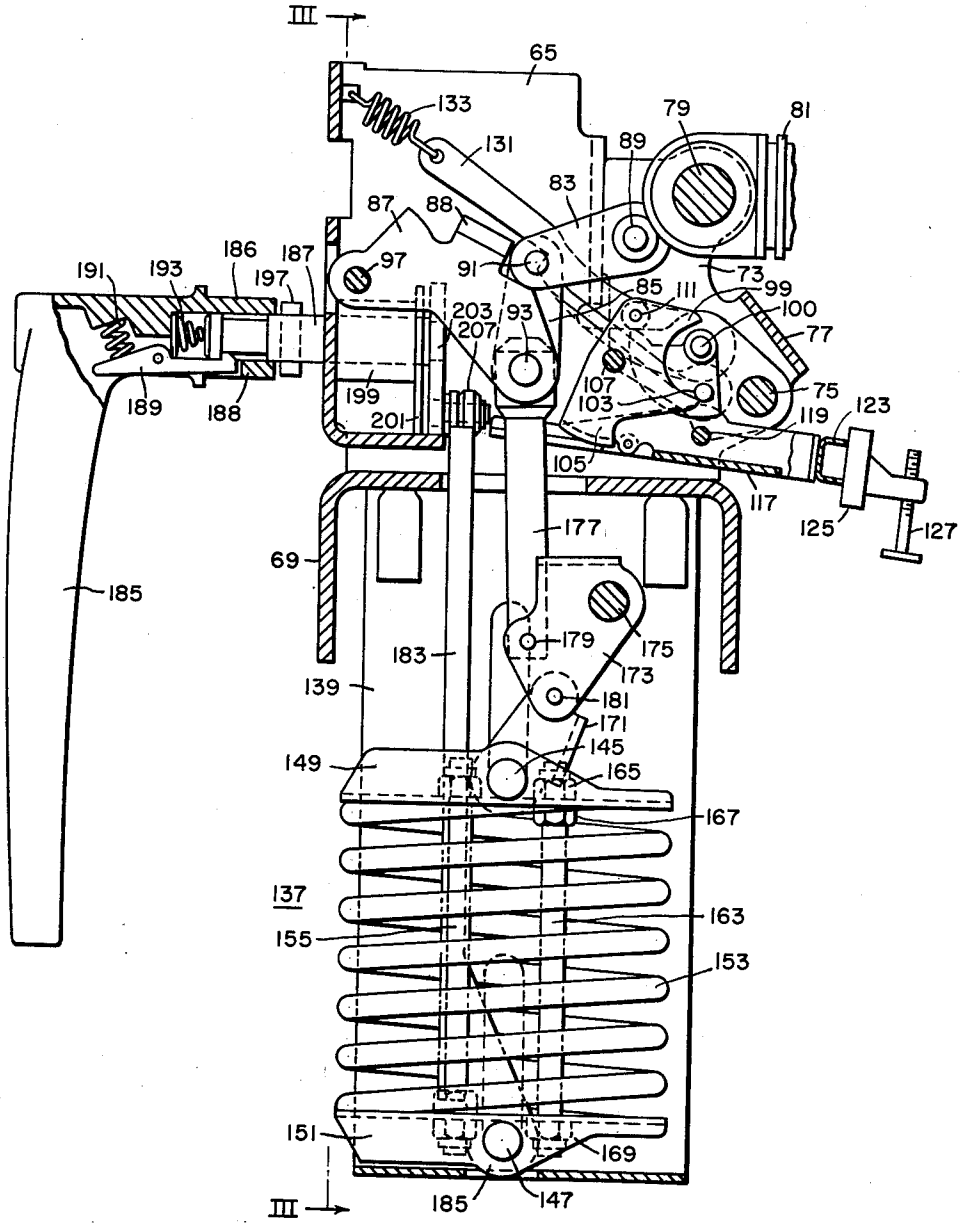
Fig. 2.



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SPRING CLOSING MECHANISM FOR CIRCUIT BREAKERS

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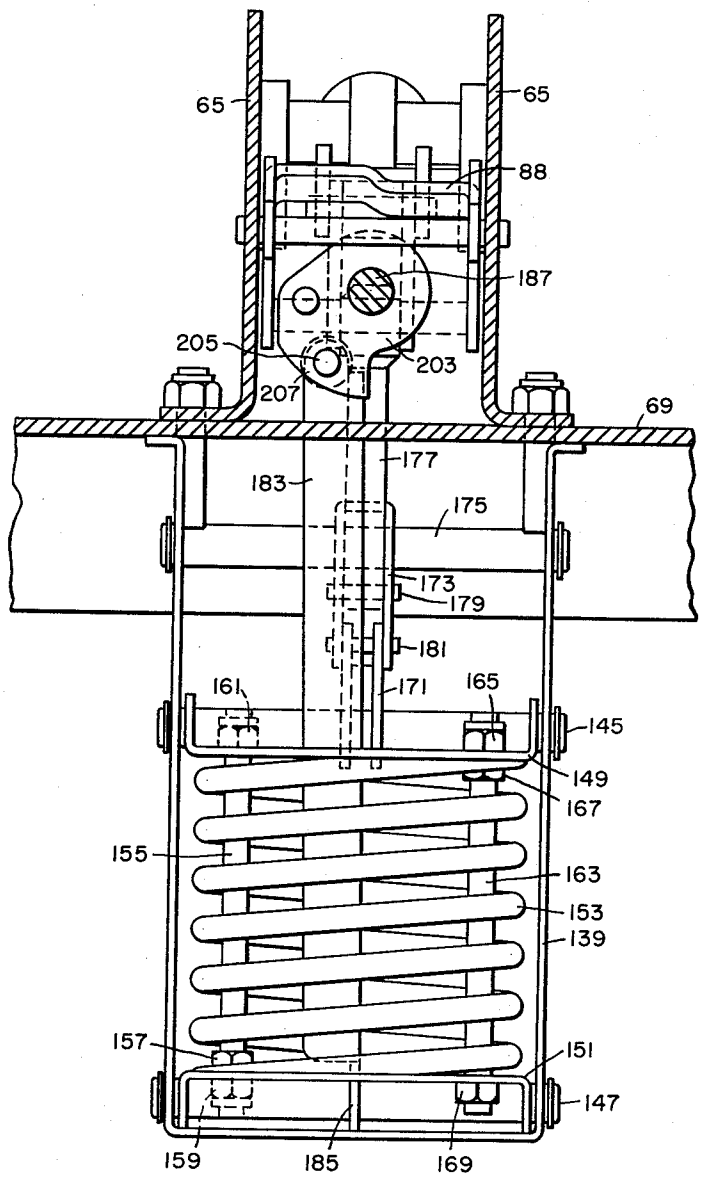
Fig. 3.



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SPRING CLOSING MECHANISM FOR CIRCUIT BREAKERS

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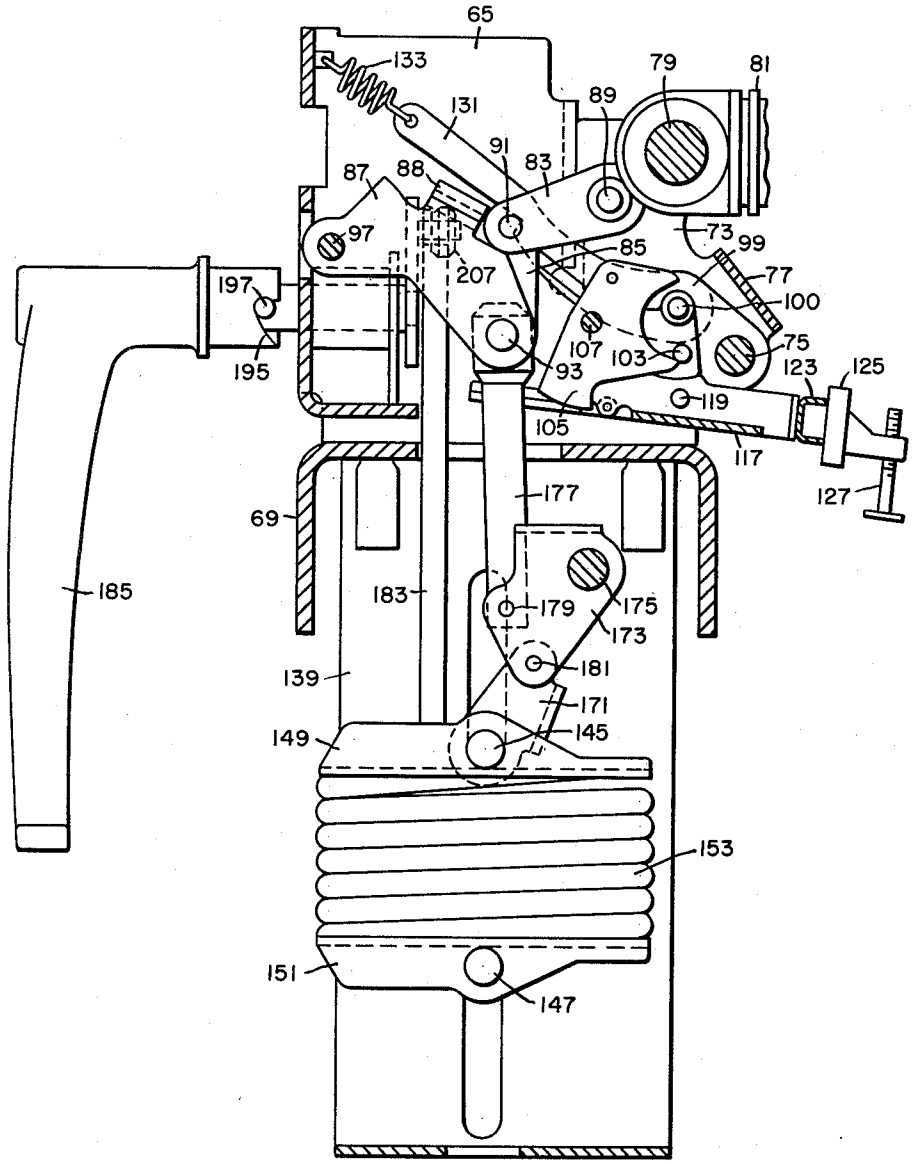
Fig. 4.



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SPRING CLOSING MECHANISM FOR CIRCUIT BREAKERS

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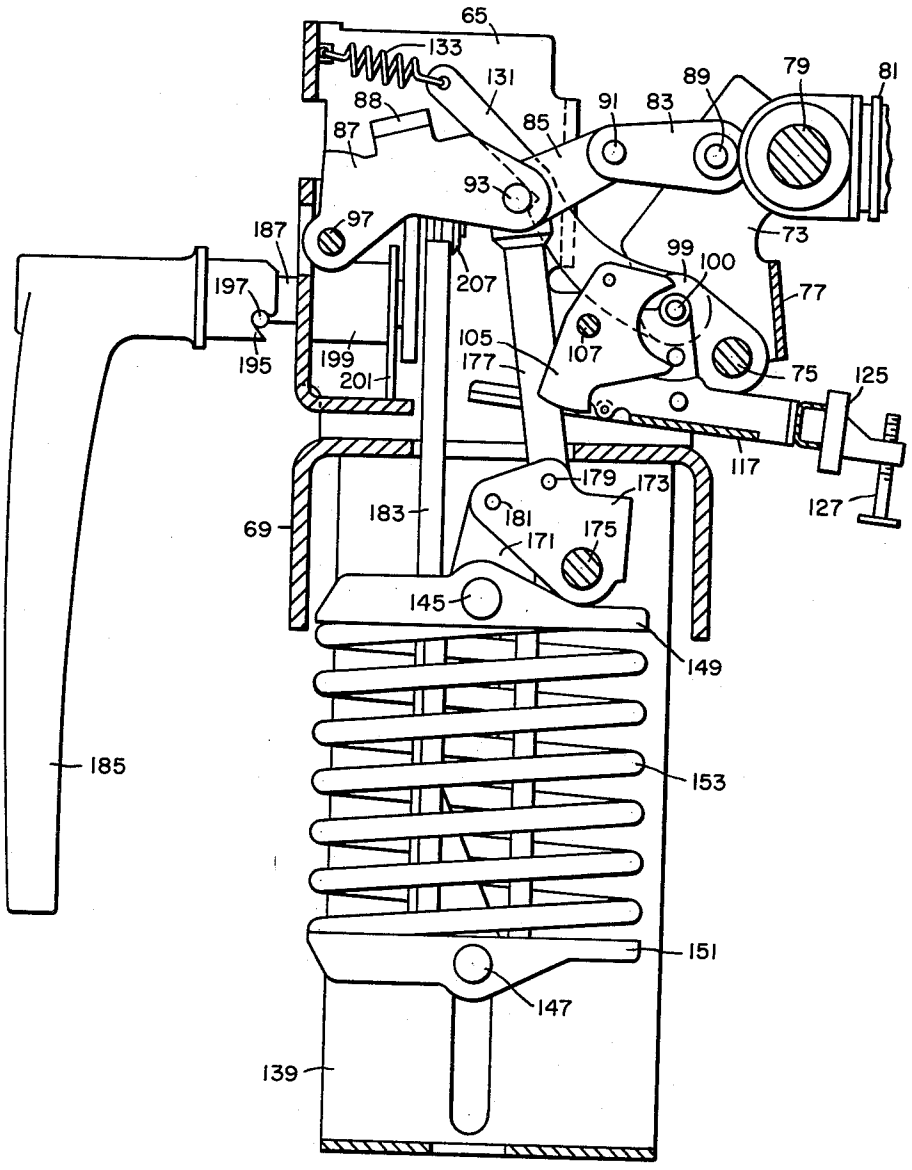
Fig. 5.



United States Patent Office 3,045,083 Patented July 17, 1962

3,045,083

SPRING CLOSING MECHANISM FOR CIRCUIT BREAKERS

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12 Claims. (Cl. 200—74)

This invention relates to circuit breakers and more particularly to a spring closing mechanism for circuit breakers.

Frequently, during circuit breaker operation, it is necessary that the breaker be closed against an energized line. Because of the high magnetic forces which oppose such a closing operation, it is necessary that the contacts of the breaker be closed rapidly and forcefully. In a manually operated circuit breaker, the operators' strength cannot be relied upon to produce the speed and force necessary for effective operation.

Accordingly, it is an object of this invention to provide a circuit breaker embodying a spring closing mechanism that is not dependent upon the strength of the operator for effective operation.

Another object is to provide a circuit breaker embodying a spring closing mechanism that utilizes the expanding force of a compression spring during a closing operation.

Another object is to provide a circuit breaker embodying a spring closing mechanism wherein a closing spring is compressed and released by a continuous motion applied to an operating handle.

A further object is to provide a circuit breaker having a spring closing mechanism and a trip-free operating mechanism wherein the weight of the spring closing mechanism assists in resetting the trip-free operating mechanism during an opening operation.

During the life of a circuit breaker, it is often necessary to operate the mechanism slowly to more easily observe the movement and relative positions of the parts for maintenance purposes.

Accordingly, it is a further object of this invention to provide a circuit breaker embodying stored energy closing means for rapidly closing the circuit breaker, and means for slowly closing the circuit breaker contacts.

A further object is to provide a circuit breaker embodying a spring closing mechanism wherein the contacts of the circuit breaker can be closed slowly without utilizing the energy of the closing spring.

A further object is to provide a circuit breaker embodying a spring closing mechanism and an operating linkage latchable in a closed position wherein the contact means of the circuit breaker can be slowly closed without latching the operating linkage in a closed position.

Other objects of the invention will be explained hereinafter or will be apparent to those skilled in the art.

The invention both as to structure and operation, together with additional objects and advantages thereof, will be best understood from the following detailed description of a preferred embodiment thereof when read in conjunction with the accompanying drawings.

In said drawings:

FIGURE 1 is a side elevational view, partly in section, of a circuit breaker embodying the principles of the invention;

FIG. 2 is a sectional view of the operating mechanism when the circuit breaker is in the open circuit position;

FIG. 3 is a sectional view taken on line III—III of FIG. 2;

FIG. 4 is a sectional view, similar to that of FIG. 2, showing the position of the operating mechanism at the moment when the closing spring, which has been compressed, is about to be released; and,

FIG. 5 is a sectional view, similar to that of FIG. 2, showing the operating mechanism in the closed circuit position.

Referring to FIG. 1 of the drawings, the circuit breaker is of the multipole type, each pole unit including a separable contact structure, indicated generally at **11**, and an overcurrent trip device indicated generally at **13**. Since the poles are similar, only the center pole of the circuit breaker is shown and described. The contact structure and the trip device for each pole are mounted on separate insulating bases **15** which are rigidly secured to a metal panel **17**. The bases **15** of the several pole units are secured to the panel **17** by means of screws **19**.

The contact structure **11** comprises stationary main contacts **23**, a stationary intermediate contact **24** and a stationary arcing contact **25**, all supported on the inner end of a terminal conductor **27** which extends through suitable clearance openings in the base **15** and panel **17**. Cooperating with the stationary main, intermediate and arcing contacts **23**, **24** and **25**, respectively, are movable main contacts **29**, a movable intermediate contact **30** and a movable arcing contact **31**. The stationary main contacts **23** are pivotally supported and are biased into engagement with the movable main contacts in the closed position of the breaker. The stationary arcing contact is mounted for limited movement in a well known manner and is biased into engagement with the moving arcing contact in the closed position. The movable main contact **29**, the movable intermediate contact **30** and the movable arcing contact **31** are supported on a movable switch member **35** pivotally mounted by means of a pivot pin **37** on a bracket **39**. The bracket **39** is secured by means of a screw **41** to the inner end of a lower terminal member **43**. Spring-biased contact members **45** provide a wiping contact with the movable switch member **35** adjacent the pivoted end thereof. A spring **47**, which is compresssed between a spring seat **49** on the base **15** and the movable switch member **35**, biases the latter in opening direction.

The movable contact structure is normally maintained in the closed position by an operating mechanism, indicated generally at **61** (FIG. 1), mounted in a U-shaped frame comprising spaced side members **65** and a connecting cross member **67**, and is supported on a platform **69**, which forms a cross member of a main bracket comprising a pair of spaced side members **71** (FIG. 1) joined at their outer ends by the platform **69**. The platform extends across the width of the breaker and the side members **71** are rigidly secured to the panel **17** on the outsides of the two outer pole units.

The operating mechanism includes an operating lever **73** pivotally mounted on a pivot pin **75** supported in the side members **65** of the frame. The lever **73** comprises a pair of spaced members joined by a cross member **77**. A rod **79** which extends across all of the poles of the breaker, is supported between the spaced members of the lever **73**. The rod **79** is operatively connected to the movable switch member **35** by means of an insulating connecting member **81** and pivot pin **82** in the switch member.

There is a connecting member **81** for each pole of the breaker connecting the rod **79** to the moving contact structure for each pole unit so that upon operation of the rod **79**, the movable contact structures for all three poles move in unison.

An operating linkage comprising toggle links **83**, **85** and **87** is provided to hold the lever **73** and consequently the movable contacts in the closed position and to operate the movable contacts to open and closed positions. Each of these links has two identical legs integral with a cross portion, the cross portion of the link **87** being shown in FIG. 3 at **88**. The toggle link **83** is pivotally connected to the lever **73** by a pivot pin **89** and the toggle link **85** is connected by a knee pivot pin **91** to the toggle link **83** and by a knee pivot pin **93** to the toggle link **87**. The toggle link **87** is pivotally mounted on a fixed pivot **97** in the frame members **65**.

The linkage **83**, **85**, **87** comprises two toggles one of which **83**, **85** functions as a tripping toggle and the other **85**, **87** as a closing toggle. The tripping toggle is normally slightly underset above a line drawn through the pivot pins **89**, **93** and the closing toggle **85**, **87** is normally slightly underset below a line drawn through the pivots **91**, **97**.

The tripping toggle **83**, **85** is normally biased in a direction to cause its collapse by the springs **47** which bias the moving contact structures for the several poles of the breaker in opening direction and bias the connecting members **81** toward the left. The tripping toggle **83**, **85** is normally prevented from collapsing by means of a main latch member **99** pivoted on a pin **100** and connected by a link **101** to the knee pin **91** of the tripping toggle, the link **101** being connected to the latch member **99** by a pivot pin **103**.

The main latch **99** is held in latching position by an intermediate latch lever **105** pivoted on a pin **107** supported in the frame members **65**. The latch lever **105** carries a latch roller **111** which normally engages the main latch **99** to releasably hold the latter in holding position. The latch lever **105** at its lower end carries a latch portion **113** which normally engages a latch roller **115** on a latch member **117** pivoted on a pin **119** in the frame members **65**. The latch lever **105** and the member **117** are biased, by spring means (not shown), to their latching positions. Rigidly mounted on the right hand end of the channel-shaped member **117** is a trip bar **123** which extends across all of the poles of the breaker and has secured thereto an insulating bracket **125** for each pole of the breaker. Each of the brackets **125** has a headed screw **127** adjustably mounted therein for cooperating with the trip device **13** for the corresponding pole unit.

As long as the main latch **99** is held in latching position by the latching mechanism just described, the tripping toggle **83**, **85** will, through the link **101**, be held in the position shown in which the breaker contacts are held in the closed position. The closing toggle **85**, **87** is normally prevented from collapsing by a shouldered support member **131** pivoted on the pin **107** and biased by a spring **133** into supporting engagement with the knee pin **93** of the closing toggle.

Referring to FIG. 1, the circuit breaker is in the closed and latched position with the support member **131** supporting the closing toggle **85**, **87** in its extended thrust transmitting position. The circuit breaker is automatically tripped open by operation of a tripping electromagnet indicated generally at **13**. The tripping electromagnet **13** may be of any suitable type, and it is arranged to trip the breaker after a time delay and also instantaneously in response to overload currents of predetermined values.

Upon the occurrence of an overload current, the tripping electromagnet produces an upward thrust of a rod **135** which strikes the screw **127** of the latch member **117**. This moves the member **117** counterclockwise disengaging the latch roller **115** from the latch portion **113** of the latch lever **105**. The latching engagement of the main latch **99** with the latch roller **111** is of the slip-off type, and as soon as the latch lever **105** is released, it is moved to unlatching position by the upward force applied to the main latch **99** through the link **101**. The tripping toggle **83**, **85** immediately collapses upwardly permitting counterclockwise movement of the operating lever **73** and opening movement of the movable contact structure. During the collapse of the tripping toggle **83**, **85**, a portion of the toggle link **85** engages and actuates the support member **131** against the bias of the spring **133** to a non-supporting position, thereby freeing the closing toggle **85**, **87**. The closing toggle thereupon collapses downwardly under the weight of the toggle linkage **83**, **85** and **87**, and the weight of a spring closing mechanism (to be described later), and during its collapse resets and relatches the tripping toggle **83**, **85**.

The linkages **83**, **85** and **85**, **87** are trip free. During an opening operation, the contacts cannot be closed until after the closing toggle collapses resetting the linkages for a closing operation.

The opening operation, as described, was initiated by energization of the tripping electromagnet **13** rotating the latch member **117** counterclockwise. The opening operation can also be initiated manually by a trip lever (not shown) that also rotates the latch member **117**.

A spring closing mechanism, indicated generally at **137**, is provided for manual closing of the circuit breaker.

The spring closing mechanism **137** is partially enclosed within a U-shaped housing **139** which is welded or otherwise attached to the underside of the platform **69**. This housing has two vertically elongated openings **141** and **143** on each side which receive cross bolts **145** and **147** which move vertically in these openings. The cross bolt **145** extends through openings in the legs of a U-shaped top spring support **149** which spring support is enclosed within the housing **139**. The cross bolt **147** extends through openings in the legs of a U-shaped bottom spring support **151** which is also enclosed within the housing **139**. The cross bolts **145** and **147** prevent horizontal rotating movement of the top and bottom spring supports. An operating compression spring **153** is disposed between the top and the bottom spring supports **149** and **151**. Two guide bolts **155** and **163** extend through openings in the bottom and top spring supports. They serve to keep the spring **153** in place; to prevent vertical wobbling movement of the bottom and the top spring supports, and to preset the amount of vertical rectilinear movement of the spring supports.

The guide bolt **155** is connected to the bottom spring support **151** by nuts **157** and **159** (FIG. 3) which are fastened to the guide bolt on each side of the bottom spring support. A stop nut **161** is fastened to the guide bolt **155** on the upper side of the top spring support **149**. The guide bolt **163** is connected to the top spring support **149** by nuts **165** and **167** which are fastened to the guide bolt on each side of the top spring support. A stop nut **169** is fastened to the guide bolt **163** on the lower side of the bottom spring support **151**. The guide bolt **155** moves vertically with the bottom spring support, and the guide bolt **163** moves vertically with the top spring support.

A toggle link **171** is pivotally connected to the vertically movable cross bolt **145**, and a toggle link **173** is pivotally connected to a stationary cross bolt **175** which is rotatably connected to the sides of the U-shaped housing **139**. The toggle link **173** is also pivotally connected to the lower end of a vertically movable thrust rod **177** by a pivot pin **179**. The thrust rod **177** has an opening in its upper end for receiving the pivot pin **93**. The toggle links **171** and **173** are pivotally connected by a pivot pin **181**.

A lift link **183** is provided for lifting the bottom spring support **151**. The lift link **183** is a flat member that passes through an opening in the top spring support **149**,

and has an angle shaped lower portion with a flat leg **185** projecting through an opening in the bottom spring support **151**. The cross bolt **147** passes through an opening in the projecting flat leg **185** of lift link **183**. Upward movement of the lift link **183**, therefore, lifts the bottom spring support **151**.

A handle **185** (FIG. 2) having a horizontal tubular portion **186** is provided for operating the spring closing mechanism. The handle is removably mounted on an operating shaft **187** by a pivotal latch **189** biased to latching position by a spring **191**. The handle has an opening for receiving a spring **193** and the outer end of the operating shaft **187**. There are two slots **195** in the handle horizontal tube **186** (only one being shown in FIGS. 4 and 5) for receiving the ends of a pin **197** which extends through the operating shaft **187**. These slots are positioned to engage the pin **197** when the handle **185** is moved to a 2:00 o'clock position and pressed in against the bias of the spring **193**. There is no compression force on the spring **193** when the parts are in the position shown in FIG. 2 and, therefore, the handle **185** can rotate freely on the operating shaft **187**.

The operating shaft **187** is rotatably mounted in a sleeve **199** which is attached to the inside base of the housing **65** by a bracket **201**. A plate **203** (FIGS. 2 and 3) is secured to the inner end of the operating shaft **187**. The plate **203** is pivotally connected to the upper end of the lift link **183** by a pivot pin **205** (FIG. 3). A contact roller **207** is rotatably mounted on the pivot pin **205**.

Referring to FIGS. 2 and 3, the parts of the circuit breaker are shown in the open circuit position. In order to close the breaker, the handle **185** is rotated counterclockwise to a 2:00 o'clock position. This positions the slots **195** (FIGS. 4 and 5) to receive the pin **197** on the operating shaft **187** as the handle is pressed in against the bias of the spring **193** (FIG. 2). The handle **185** is then rotated clockwise, thereby rotating the operating shaft **187** and the plate **203** in a clockwise (FIG. 3) direction. As the plate **203** rotates, it lifts the lift link **183** and the bottom spring support **151**. Upward movement of the top spring support **149** is prevented because the toggle links **171** and **173** are on dead center. The upward movement of the lift link **183**, therefore, compresses the spring **153** between the bottom spring support **151** and top spring support **149** (FIG. 4).

In the position shown in FIG. 4, the contact roller **207** of the lift link **183** is positioned between the legs of the toggle link **87**, and is just making contact with the underside of the cross portion **88** which is integral with the legs of the toggle link **87**. Upon further clockwise rotation of the operating handle **185**, the contact roller **207** is raised with the lift link **183**, and it pivots the toggle link **87** counterclockwise about the pivot pin **97** raising the thrust rod **177** which rotates the toggle link **173** clockwise about its pivot **175**. This moves the toggle **171, 173** off of dead center permitting it to collapse which, in turn, permits upward movement of the top spring support **149** under the expanding force of the compression spring **153**.

As the top spring support **149** is forced up, it rapidly collapses the toggle **171, 173** and forces the thrust rod **177** upwards. As shown in FIGS. 2 and 4, the closing toggle **85, 87** is collapsed and the tripping toggle **83, 85** is held in thrust transmitting position. Therefore, as the thrust rod **177** is forced upwardly, it straightens the closing toggle **85, 87** moving the operating lever **73** clockwise to close the breaker (FIG. 5). The operator then releases hold on the handle **185**, and the spring **193** moves the handle axially out of engagement with the pin **197** permitting the handle to fall to its normal vertical position by gravity.

The closing operation under the expanding force of the compression spring **153** is rapid and forceful. For maintenance purposes, it is desirable to be able to close the

breaker contacts **23, 29**; **24, 30**; and **25, 31** slowly so that the interaction and relative positions of these contacts may be observed. The circuit breaker contacts of this invention may be closed slowly by first breaking the toggle **171, 173** off of dead center by slightly pushing rod **79** towards the closed position. This permits upward movement of the top spring support **149** and prevents complete compression of the spring **153**. The toggle **171, 173**, therefore, slowly collapses and forces the thrust rod **177** upwards as the bottom spring support **151** is raised. The only closing force, therefore, is that applied to the handle **185** in order to raise the bottom spring support **151**. In this manner, the speed of closing the contacts is determined by the speed at which the operator rotates the handle **185**.

During this slow closing operation the spring **153** compresses to some extent under the restraining forces of the operating mechanism and movable contact structure. This compression is such that the operating linkage **83, 85** and **87** will not be latched in a closed position by the support member **131** when the lift link **183** has reached its uppermost position. The contacts, however, close before the operating linkage **83, 85** and **87** reaches a latched position. For maintenance purposes, therefore, an operator can slowly and continually open and close the contacts without latching the operating linkage in a closed position. This permits observation of the wiping action and relative positions of the contacts during a closing operation.

It is important to note that the operating linkage **83, 85** and **87** is trip free. During the opening operation as previously described, the tripping toggle **83, 85** first collapses, and until the closing toggle **85, 87** collapses downwardly to reset the tripping toggle **83, 85** into a thrust transmitting position, the circuit breaker cannot be closed. During the opening operation, it is the weight of the spring closing mechanism **137** and of the operating linkage **83, 85** and **87** that pulls the thrust rod **177** and hence the closing toggle **85, 87** down to reset the linkages.

From the foregoing description, it will be apparent that a spring closing mechanism has been provided which so utilizes the energy of a compression spring that an operator may forcefully and rapidly close the contacts of a circuit breaker. The spring closing mechanism also assists in resetting the trip-free linkages of the circuit breaker during an opening operation. Moreover, the circuit breaker contacts can be closed slowly without utilizing the energy of the compression spring when a careful observation of the interaction and relative positions of parts is desired for maintenance purposes.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understood that various changes in the structural details and arrangement of parts thereof may be made wihout departing from the spirit and scope of the invention.

We claim as our invention:

1. A circuit breaker having relatively stationary contact means and movable contact means cooperating with said relatively stationary contact means to open and close the circuit breaker, a closing spring, means for compressing the closing spring, means for releasing the compressed closing spring to rapidly close the circuit breaker, and means for slowly closing the circuit breaker contact means without utilizing the expanding force of the closing spring.

2. A circuit breaker having relatively stationary contact means and movable contact means cooperating with said relatively stationary contact means to open and close said circuit breaker, stored energy closing means, means for operating said stored energy closing means to rapidly close said circuit breaker, and means for slowly closing said circuit breaker contact means without utilizing the energy of said stored energy closing means.

3. A circuit breaker comprising, in combination, relatively stationary contact means, movable contact means cooperating with said relatively stationary contact means to open and close said circuit breaker, an operating link-

age for moving said movable contact structure, means for latching said operating linkage in a closed position, a closing spring, means for compressing said closing spring, means for releasing said compressed closing spring to rapidly close said circuit breaker, and means for slowly closing said circuit breaker contact means without latching said operating linkage in a closed position.

4. In a circuit breaker having relatively stationary contact means and movable contact means cooperating therewith to open and close said circuit breaker, a bottom spring support, a top spring support, a closing spring supported between said bottom and top spring supports, restraining means for preventing vertical movement of said top spring support, lifting means for raising said bottom spring support to compress said closing spring between said top and bottom spring supports, releasing means for releasing said restraining means after said closing spring has been compressed permitting expansion of said compressed closing spring to rapidly close said circuit breaker, an operating handle, said lifting means and said releasing means being operated by said operating handle, and means for releasing said restraining means before said closing spring is compressed permitting a slow closing of said circuit breaker contact means.

5. In a circuit breaker having relatively stationary contact means and movable contact means cooperating therewith to open and close said circuit breaker, a bottom spring support, a top spring support, a closing spring supported between said bottom and top spring supports, restraining means for preventing vertical movement of said top spring support, lifting means for raising said bottom spring support to compress said closing spring between said top and bottom spring supports, means for releasing said restraining means after said closing spring has been compressed permitting expansion of said compressed closing spring to rapidly close said circuit breaker, and means for releasing said restraining means before said closing spring is compressed permitting a slow closing of said circuit breaker contact means.

6. In a circuit breaker having relatively stationary contact means and movable contact means cooperating therewith to open and close said circuit breaker, a bottom spring support, a top spring support, a closing spring supported between said bottom and top spring supports, restraining means for preventing vertical movement of said top spring support, lifting means for raising said bottom spring support to compress said closing spring between said top and bottom spring supports, releasing means for releasing said restraining means after said closing spring has been compressed permitting expansion of said compressed closing spring to rapidly close said circuit breaker, an operating handle, said lifting means and said releasing means being operated by a continuous movement of said operating handle, and means for releasing said restraining means before said closing spring is compressed permitting a slow closing of said circuit breaker contact means.

7. A circuit breaker including, in combination, relatively stationary contact means, a movable contact structure cooperating with said stationary contact means to open and close said circuit breaker, a trip free operating linkage in thrust transmitting position to move said movable contact structure to close said circuit breaker, spring closing means cooperating with said operating linkage to close said circuit breaker, said operating linkage collapsing and being reset to a thrust transmitting position during an opening operation, and the weight of said spring closing means contributing to reset said operating linkage during an opening operation.

8. A circuit breaker having relatively stationary contact means and a movable contact structure cooperating therewith to open and close said circuit breaker, a trip-free operating linkage for moving said movable contact structure, a spring closing mechanism including a closing spring for operating said trip-free operating linkage to close said circuit breaker, an operating handle movable to compress said closing spring, releasing means operated by said handle for releasing said compressed closing spring, the expanding force of said released closing spring moving said movable contact structure to close said circuit breaker, and the weight of said spring closing mechanism contributing to reset said trip-free operating linkage during an opening operation.

9. A circuit breaker having relatively stationary contact means and a movable contact structure cooperating therewith to open and close said circuit breaker, a trip-free operating linkage for moving said movable contact structure, a spring closing mechanism including a closing spring for operating said trip-free operating linkage to close said circuit breaker, an operating handle movable to compress said closing spring, releasing means operated by said handle for releasing said compressed closing spring, the expanding force of said released closing spring moving said movable contact structure to close said circuit breaker, said closing spring being compressed and released by a continuous movement of said operating handle, and the weight of said spring closing mechanism contributing to reset said trip-free operating linkage during an opening operation.

10. A circuit breaker comprising, in combination, relatively stationary contact means, a movable contact structure cooperating with said stationary contact means to open and close said circuit breaker, an operating linkage for moving said movable contact structure to close said circuit breaker, a thrust rod having one end connected to said operating linkage, a toggle connected to the other end of said thrust rod, a top spring support connected to said toggle, said toggle being positioned substantially on dead center preventing upward movement of said thrust rod and said top spring support, a bottom spring support, a closing spring supported between said top and bottom spring supports, an operating handle, means operated by said operating handle to break said toggle off spring support compressing said closing spring, and means operating by said operating handle to break said toggle off of dead center allowing upward movement of said top spring support and said thrust rod under the expanding force of said compressed closing spring to close said circuit breaker.

11. A circuit breaker comprising, in combination, relatively stationary contact means, movable contact means cooperating with said stationary contact means to open and close said circuit breaker, an operating linkage for moving said movable contact means to close said circuit breaker, a thrust rod having one end connected to said operating linkage, a toggle connected to the other end of said thrust rod, a top spring support connected to said toggle, said toggle being positioned substantially on dead center preventing upward movement of said thrust rod and said top spring support, a bottom spring support, a closing spring supported between said top and bottom spring supports, an operating handle for lifting said bottom spring support to compress said closing spring, means operated by said operating handle to break said toggle off of dead center allowing upward movement of said top spring support and said thrust rod under the expanding force of said compressed closing spring, and means for breaking said toggle prior to the initiation of a closing operation allowing the circuit breaker contact means to be closed slowly by operation of the operating handle.

12. A circuit breaker comprising a pair of contacts cooperable to open and close an electric circuit, a spring closing mechanism comprising a first spring support and a second spring support, a compression-type spring supported between said first and second spring supports, an operating handle rotatable to move said first spring support toward said second spring support, an operating linkage comprising a toggle in a latching position to prevent movement of said second spring support while said operating handle is being rotated whereby said spring

becomes compressed between said first and second spring supports, means operable by continued rotational movement of said operating handle after said spring is compressed a certain amount to unlatch said toggle whereupon said compressed spring expands to move said second spring support away from said first spring support, and said movement of said second spring support effecting closing of said contacts.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,045,083 July 17, 1962

Gayne D. Gamel et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 8, line 38, for "break said toggle off" read -- lift said bottom --; line 40, for "operating", first occurrence, read -- operated --.

Signed and sealed this 19th day of February 1963.

(SEAL)
Attest:

ESTON G. JOHNSON
Attesting Officer

DAVID L. LADD
Commissioner of Patents